



Factsheet: Systems, Robotics

A technology field created by ip-search

1 Definition

Robotics is the branch of engineering involving the conception, design, manufacture and operation of robots, i.e. self-steering devices, apparatus or machines – a broad and diverse field related to many commercial industries and consumer uses. The present technology field does include parts of the domain of autonomous driving, describing self-guided or automated devices or machines.

2 CPC / IPC

Cooperative Patent Classification (CPC)

CPC/IPC/FI Symbols	Description
A	HUMAN NECESSITIES
A61	MEDICAL OR VETERINARY SCIENCE; HYGIENE
A61B	DIAGNOSIS; SURGERY; IDENTIFICATION (analysing biological material G01N, e.g. G01N33/48; obtaining records using waves other than optical waves, in general G03B42/00)
A61B34/00	Computer-aided surgery; Manipulators or robots specially adapted for use in surgery
<u>A61B34/30</u>	. Surgical robots
A61F	FILTERS IMPLANTABLE INTO BLOOD VESSELS; PROSTHESES; DEVICES PROVIDING PATENCY TO, OR PREVENTING COLLAPSING OF, TUBULAR STRUCTURES OF THE BODY, E.G. STENTS; ORTHOPAEDIC, NURSING OR CONTRACEPTIVE DEVICES; FOMENTATION; TREATMENT OR PROTECTION OF EYES OR EARS; BANDAGES, DRESSINGS OR ABSORBENT PADS; FIRST-AID KITS (dental prosthetics A61C)
A61F2/00	Filters implantable into blood vessels; Prostheses, i.e. artificial substitutes or replacements for parts of the body; Appliances for connecting them with the body; Devices providing patency to, or preventing collapsing of, tubular structures of the body, e.g. stents (as cosmetic articles, see the relevant subclasses, e.g. wigs, hair pieces, A41G3/00, A41G5/00, artificial nails A45D31/00; dental prostheses A61C13/00; materials for prostheses A61L27/00; artificial hearts A61M1/10; artificial kidneys A61M1/14)
A61F2/02	. Prostheses implantable into the body {(closure means for urethra or rectum or for artificial body openings therefor A61F2/0004)}
A61F2/30	.. Joints
A61F2/46	... Special tools or methods for implanting or extracting artificial joints, accessories, bone grafts or substitutes, or particular adaptations therefor
<u>A61F2002/4632</u> {using computer-controlled surgery, e.g. robotic surgery}
A61F2/50	. Prostheses not implantable in the body {(closure means for urethra or rectum or for artificial body openings therefor A61F2/0004)}
A61F2/68	.. Operating or control means
A61F2/70	... electrical {(not used, see A61F2/68 and A61F2/72)}
<u>A61F2002/704</u> {computer-controlled, e.g. robotic control}
A61H	PHYSICAL THERAPY APPARATUS, e.g. DEVICES FOR LOCATING OR STIMULATING REFLEX POINTS IN THE BODY; ARTIFICIAL RESPIRATION; MASSAGE; BATHING DEVICES FOR SPECIAL THERAPEUTIC OR HYGIENIC PURPOSES OR SPECIFIC PARTS OF THE BODY (electrotherapy, magnetotherapy, radiation therapy, ultrasound therapy A61N)

CPC/IPC/FI Symbols	Description
A61H2201/00 A61H2201/16 A61H2201/1657 <u>A61H2201/1659</u>	Characteristics of apparatus not provided for in the preceding codes . Physical interface with patient .. Movement of interface, i.e. force application means ... Free spatial automatic movement of interface within a working area, e.g. Robot
A61N A61N5/00 A61N5/10 A61N5/1077 <u>A61N5/1083</u>	ELECTROTHERAPY; MAGNETOTHERAPY; RADIATION THERAPY; ULTRASOUND THERAPY (measurement of bioelectric currents A61B; surgical instruments, devices or methods for transferring non-mechanical forms of energy to or from the body A61B18/00; anaesthetic apparatus in general A61M; incandescent lamps H01K; infra-red radiators for heating H05B) Radiation therapy (ultrasound therapy A61N7/00; devices or apparatus applicable to both therapy and diagnosis A61B6/00) . X-ray therapy; Gamma-ray therapy; Particle-irradiation therapy (A61N5/01 takes precedence) .. {Beam delivery systems} ... {Robot arm beam systems}
A63 A63H <u>A63H11/00</u> A63H33/00 <u>A63H33/003</u>	SPORTS; GAMES; AMUSEMENTS TOYS, e.g. TOPS, DOLLS, HOOPS, BUILDING BLOCKS Self-movable toy figures Other toys . {Convertible toys, e.g. robots convertible into rockets or vehicles convertible into planes}
B B01 B01J B01J2219/00 B01J2219/00274 B01J2219/0068 B01J2219/00686 <u>B01J2219/00691</u>	PERFORMING OPERATIONS; TRANSPORTING PHYSICAL OR CHEMICAL PROCESSES OR APPARATUS IN GENERAL (furnaces, kilns, ovens, retorts in general F27) CHEMICAL OR PHYSICAL PROCESSES, e.g. CATALYSIS OR COLLOID CHEMISTRY; THEIR RELEVANT APPARATUS Chemical, physical or physico-chemical processes in general; Their relevant apparatus . Sequential or parallel reactions; Apparatus and devices for combinatorial chemistry or for making arrays; Chemical library technology .. Means for controlling the apparatus of the process ... Automatic using robots
B07 B07C B07C2501/00 <u>B07C2501/0063</u>	SEPARATING SOLIDS FROM SOLIDS; SORTING (separation in general B01D; wet separating processes, sorting by processes using fluent material in the same way as liquid B03; using liquids B03B, B03D; sorting by magnetic or electrostatic separation of solid materials from solid materials or fluids, separation by high voltage electric fields B03C; centrifuges or vortex apparatus for carrying out physical processes B04; sorting peculiar to particular materials or articles and provided for in other classes, see the relevant classes) POSTAL SORTING; SORTING INDIVIDUAL ARTICLES, OR BULK MATERIAL FIT TO BE SORTED PIECE-MEAL, e.g. BY PICKING (specially adapted for a specific purpose covered by another class, see the relevant place, e.g. A43D33/06, B23Q7/12) Sorting according to a characteristic or feature of the articles or material to be sorted . Using robots
B23 B23K	MACHINE TOOLS; METAL-WORKING NOT OTHERWISE PROVIDED FOR (punching, perforating, making articles by processing sheet metal, tubes, or profiles B21D; wire-working B21F; making pins, needles, or nails B21G; making chains B21L; grinding B24) SOLDERING OR UNSOLDERING; WELDING; CLADDING OR PLATING BY SOLDERING OR WELDING; CUTTING BY APPLYING HEAT LOCALLY, e.g. FLAME CUTTING; WORKING BY LASER BEAM (making metal-coated products by extruding metal B21C23/22; building up linings or coverings by casting B22D19/08; casting by dipping B22D23/04; manufacture of composite layers by sintering metal powder B22F7/00; arrangements on machine tools for copying or controlling B23Q; covering metals or covering materials with metals, not otherwise provided for C23C; burners F23D)

CPC/IPC/FI Symbols	Description
B23K11/00	Resistance welding; Severing by resistance heating
B23K11/30	. Features relating to electrodes (form or composition of electrodes B23K35/00)
B23K11/31	.. Electrode holders {and actuating devices therefor} (not restricted to resistance welding or severing by resistance heating B23K37/02)
<u>B23K11/314</u>	... {Spot welding guns, e.g. mounted on robots}
B23K26/00	Working by laser beam, e.g. welding, cutting or boring
B23K26/08	. Devices involving relative movement between laser beam and workpiece
B23K26/0869	.. {Devices involving movement of the laser head in at least one axial direction}
B23K26/0876	... {in at least two axial directions}
<u>B23K26/0884</u> {in at least in three axial directions, e.g. manipulators, robots}
B25	HAND TOOLS; PORTABLE POWER-DRIVEN TOOLS; MANIPULATORS
B25J	MANIPULATORS; CHAMBERS PROVIDED WITH MANIPULATION DEVICES ({manipulators specially adapted for use in surgery A61B34/70; manipulators used in cleaning hollow articles B08B9/04};manipulators associated with rolling mills B21B39/20; manipulators associated with forging machines B21J13/10; {manipulators associated with picking-up and placing mechanisms B23P19/007};means for holding wheels or parts thereof B60B30/00; {vehicles with ground-engaging propulsion means, e.g. walking members B62D57/02, B62D57/032; devices for picking-up and depositing articles or materials between conveyors B65G47/90, B65G47/91; manipulators with gripping or holding means for transferring packages B65H67/065}; cranes B66C; {manipulators used in the protection or supervision of pipe-line installations F17D5/00; walking equipment adapted for nuclear steam-generators F22B37/006}; manipulators specially adapted for, or associated with, nuclear reactors G21C; {apparatus used for handling wafers during manufacture or treatment of semiconductor H01L21/68})
<u>B25J5/00</u>	Manipulators mounted on wheels or on carriages (B25J1/00 takes precedence; programme-controlled manipulators B25J9/00 {; vehicle aspects B60, B62, e.g. remote-controlled steering for motor vehicles B62D1/24; control of position of vehicles G05D1/00})
<u>B25J9/00</u>	Programme-controlled manipulators
<u>B25J9/10</u>	. characterised by positioning means for manipulator elements
<u>B25J9/16</u>	. Programme controls (programme controls in general G05B19/00, e.g. numerical programme controls G05B19/18; {recording or playback systems G05B19/42})
<u>B25J11/00</u>	Manipulators not otherwise provided for
B25J11/0005	. {Manipulators having means for high-level communication with users, e.g. speech generator, face recognition means}
<u>B25J11/0015</u>	.. {Face robots, animated artificial faces for imitating human expressions}
<u>B25J15/00</u>	Gripping heads {and other end effectors (grippers used in machine tools B23Q7/04; gripping members fitted on cranes B66C1/42, B66C1/44; gripping means used in the manufacture of semiconductors H01L21/68707; gripping means used for mounting electrical components H05K13/04)}
<u>B25J17/00</u>	Joints
<u>B25J18/00</u>	Arms
B25J19/00	Accessories fitted to manipulators, e.g. for monitoring, for viewing; Safety devices combined with or specially adapted for use in connection with manipulators (safety-devices in general F16P; protection against radiation in general G21F)
B25J19/0025	. {Means for supplying energy to the end effector}
<u>B25J19/0029</u>	.. {arranged within the different robot elements}
B29	WORKING OF PLASTICS; WORKING OF SUBSTANCES IN A PLASTIC STATE, IN GENERAL (processing doughs A21C; working chocolate A23G; casting of metals B22; working cement, clay B28; chemical aspects, see section C, particularly C08; working glass C03B; candle making C11C5/02; making soap C11D13/00; manufacture of artificial filaments, threads, fibres, bristles or ribbons D01D, D01F; manufacture of articles from cellulosic fibrous suspensions or from papier-mâché D21J)
B29C	SHAPING OR JOINING OF PLASTICS; SHAPING OF MATERIAL IN A PLASTIC STATE, NOT OTHERWISE PROVIDED FOR; AFTER-TREATMENT OF THE SHAPED PRODUCTS, e.g. REPAIRING (making preforms B29B11/00; making

CPC/IPC/FI Symbols	Description
B29C66/00	laminated products by combining previously unconnected layers which become one product whose layers will remain together B32B37/00 - B32B41/00
B29C66/80	{General aspects of processes or apparatus for joining preformed parts (means for handling the parts to be joined B29C65/78; testing the joint B29C65/82)}
B29C66/84	. {General aspects of machine operations or constructions and parts thereof}
<u>B29C66/863</u>	.. {Specific machine types or machines suitable for specific applications}
B29C70/00	... {Robotised, e.g. mounted on a robot arm}
B29C70/04	Shaping composites, i.e. plastics material comprising reinforcements, fillers or preformed parts, e.g. inserts
B29C70/28	. comprising reinforcements only, e.g. self-reinforcing plastics
B29C70/30	.. Shaping operations therefor
<u>B29C70/38</u>	... Shaping by lay-up, i.e. applying fibres, tape or broadsheet on a mould, former or core; Shaping by spray-up, i.e. spraying of fibres on a mould, former or core {(by winding and joining, e.g. filament winding B29C53/56; for building tyres B29D30/08)}
B29C2945/00 Automated lay-up, e.g. using robots, laying filaments according to predetermined patterns {(application heads for tyres B29D30/28)}
B29C2945/76	Indexing scheme relating to injection moulding, i.e. forcing the required volume of moulding material through a nozzle into a closed mould
B29C2945/76177	. Measuring, controlling or regulating
B29C2945/76314	.. Location of measurement (not used)
<u>B29C2945/76317</u>	... Auxiliary devices
B32 robots, grippers
B32B	LAYERED PRODUCTS
B32B38/00	LAYERED PRODUCTS, i.e. PRODUCTS BUILT-UP OF STRATA OF FLAT OR NON-FLAT, e.g. CELLULAR OR HONEYCOMB, FORM
B32B38/18	Ancillary operations in connection with laminating processes
<u>B32B2038/1891</u>	. Handling of layers or the laminate
B60	.. {Using a robot for handling the layers}
B60C	VEHICLES IN GENERAL
B60C25/00	VEHICLE TYRES (manufacture B29); TYRE INFLATION; TYRE CHANGING OR REPAIRING; REPAIRING, OR CONNECTING VALVES TO, INFLATABLE ELASTIC BODIES IN GENERAL; DEVICES OR ARRANGEMENTS RELATED TO TYRES (testing of tyres G01M17/02)
B60C25/01	Apparatus or tools adapted for mounting, removing, repairing or inspecting pneumatic or solid tyres (apparatus or tools for mounting or dismounting wheels B60B29/00; apparatus or tools characterised by the means for holding wheels or parts thereof B60B30/00)
B60C25/05	. for manually removing tyres from or mounting tyres on wheels
B60C25/0563	.. Machines {, i.e. motorized devices, e.g. for mounting, demounting (matching of tyres with rims, i.e. conjoint balancing G01M)}
<u>B60C25/0587</u>	... {Tools interacting with the tyre and moved in relation to the tyre during operation}
B60C25/18 {Programmed tool path, e.g. robot arm with multiple degrees of freedom}
<u>B60C25/185</u>	. Tools for mounting or demounting air valves
B62	.. {Automated devices, e.g. robots}
B62D	LAND VEHICLES FOR TRAVELLING OTHERWISE THAN ON RAILS
	MOTOR VEHICLES; TRAILERS (steering, or guiding on a desired track, of agricultural machines or implements A01B69/00; wheels, castors, axles, increasing wheel adhesion B60B; vehicle tyres, tyre inflation or tyre changing B60C; connections between vehicles of a train or the like B60D; vehicles for use on rail and road, amphibious or convertible vehicles B60F; suspension arrangements B60G; heating, cooling, ventilating or other air treating devices B60H; windows, windscreens, non-fixed roofs, doors or similar devices, protective coverings for vehicles not in use B60J; propulsion plant arrangements, auxiliary drives, transmissions, controls, instrumentation or dashboards B60K; electric equipment or propulsion of electrically-propelled vehicles B60L; power supply for electrically-propelled vehicles B60M; passenger accommodation not otherwise provided for B60N; adaptations for load transportation or to carry special loads or objects B60P; arrangement of signalling or lighting devices, the mounting or supporting thereof or

CPC/IPC/FI Symbols	Description
<u>B62D57/00</u>	circuits therefor, for vehicles in general B60Q; vehicles, vehicle fittings or vehicle parts not otherwise provided for B60R; servicing, cleaning, repairing, supporting, lifting, or manoeuvring, not otherwise provided for, B60S; brake arrangements, brake control systems or parts thereof B60T; air-cushion vehicles B60V; motor-cycles, accessories therefor B62J, B62K; testing of vehicles G01M) Vehicles characterised by having other propulsion or other ground- engaging means than wheels or endless track, alone or in addition to wheels or endless track (sledges B62B; motor sledges B62M)
B64 B64G B64G1/00 B64G1/22 B64G1/24	AIRCRAFT; AVIATION; COSMONAUTICS COSMONAUTICS; VEHICLES OR EQUIPMENT THEREFOR (apparatus for, or methods of, winning materials from extraterrestrial sources E21C51/00) Cosmonautic vehicles . Parts of, or equipment specially adapted for fitting in or to, cosmonautic vehicles .. Guiding or controlling apparatus, e.g. for attitude control (jet-propulsion plants F02K; navigation or navigational instruments, see the relevant subclass, e.g. G01C; automatic pilots G05D1/00)
<u>B64G2001/247</u>	... {Advanced control concepts for autonomous, robotic spacecraft, e.g. by using artificial intelligence, neural networks or autonomous agents}
B64G4/00 <u>B64G2004/005</u>	Tools specially adapted for use in space . {Robotic manipulator systems for use in space}
B65 B65F B65F2230/00 <u>B65F2230/14</u>	CONVEYING; PACKING; STORING; HANDLING THIN OR FILAMENTARY MATERIAL GATHERING OR REMOVAL OF DOMESTIC OR LIKE REFUSE (disinfecting refuse A61L; refuse disintegrators B02C; sorting refuse B03B; B07B; handcarts for transporting refuse receptacles B62B; sack holders B65B67/00; converting refuse into fertilisers C05F; converting refuse into solid fuels C10L; sewers, cesspools E03F; arrangements in buildings for the disposal of refuse E04F17/10; refuse-consuming furnaces F23G; {for surgical articles A61B50/36}) Shapes of refuse receptacles . Robot
B65G <u>B65G49/00</u>	TRANSPORT OR STORAGE DEVICES, e.g. CONVEYORS FOR LOADING OR TIPPING, SHOP CONVEYOR SYSTEMS OR PNEUMATIC TUBE CONVEYORS (packaging B65B; handling thin or filamentary materials, e.g. paper sheets or thread, B65H; cranes B66C; portable mobile or lifting or hauling appliances, e.g. hoists, B66D; devices for lifting or lowering goods for loading or unloading purposes, e.g. fork-lift trucks, B66F9/00; emptying bottles, jars, casks, barrels or similar containers, not otherwise provided for, B67C9/00; delivering or transferring liquids B67D; filling or discharging vessels for liquefied, solidified or compressed gases F17C; pipe-line systems for fluids F17D) Conveying systems characterised by their application for specified purposes not otherwise provided for
B65H B65H2555/00 B65H2555/30 <u>B65H2555/31</u>	HANDLING THIN OR FILAMENTARY MATERIAL, e.g. SHEETS, WEBS, CABLES Actuating means . Multi-axis .. Robots
B67 B67D B67D7/00	OPENING, CLOSING {OR CLEANING} BOTTLES, JARS OR SIMILAR CONTAINERS; LIQUID HANDLING (nozzles in general B05B; packaging liquids B65B, e.g. B65B3/00; pumps in general F04; siphons F04F10/00; valves F16K; handling liquefied gases F17C) DISPENSING, DELIVERING OR TRANSFERRING LIQUIDS, NOT OTHERWISE PROVIDED FOR (cleaning pipes or tubes or systems of pipes or tubes B08B9/02; emptying or filling of bottles, jars, cans, casks, barrels, or similar containers, not otherwise provided for B67C; water supply E03; pipe systems F17D; domestic hot-water supply systems F24D; measuring volume, volume flow, mass flow or liquid level, metering by volume G01F; coin-freed or like apparatus G07F) Apparatus or devices for transferring liquids from bulk storage containers or reservoirs into vehicles or into portable containers, e.g. for retail sale purposes (general disposition of plant in stations for supplying fuel to vehicles B60S5/02; for filling or emptying locomotive water tanks, e.g. water columns, B61K11/00; for

CPC/IPC/FI Symbols	Description
B67D7/04 B67D7/0401 B67D2007/0403	refuelling aircraft during flight B64D39/00; liquid- handling ground installations specially adapted for fuelling stationary aircraft B64F1/28) . for transferring fuels, lubricants or mixed fuels and lubricants .. {arrangements for automatically fuelling vehicles, i.e. without human intervention} ... {Fuelling robots}
F F16 F16C F16C2322/00 F16C2322/50 F16C2322/59	MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING ENGINEERING ELEMENTS AND UNITS; GENERAL MEASURES FOR PRODUCING AND MAINTAINING EFFECTIVE FUNCTIONING OF MACHINES OR INSTALLATIONS; THERMAL INSULATION IN GENERAL SHAFTS; FLEXIBLE SHAFTS; ELEMENTS OR CRANKSHAFT MECHANISMS; ROTARY BODIES OTHER THAN GEARING ELEMENTS; BEARINGS Apparatus used in shaping articles (in general B21 - B32) . Hand tools, workshop equipment or manipulators (in general B25) .. Manipulators, e.g. robot arms (in general B25J)
F16H F16H61/00 F16H2061/0068 F16H2061/0071	GEARING Control functions within {control units of} change-speed- or reversing-gearings for conveying rotary motion {; Control of exclusively fluid gearing, friction gearing, gearings with endless flexible members or other particular types of gearing} . {Method or means for testing of transmission controls or parts thereof} .. {Robots or simulators for testing control functions in automatic transmission (testing of transmissions G01M13/02)}
G G01 G01N G01N21/00 G01N21/84 G01N21/88 G01N21/95 G01N21/9515 G01N2021/9518 G01N35/00 G01N35/0099	PHYSICS MEASURING (counting G06M); TESTING INVESTIGATING OR ANALYSING MATERIALS BY DETERMINING THEIR CHEMICAL OR PHYSICAL PROPERTIES (separating components of materials in general B01D, B01J, B03, B07; apparatus fully provided for in a single other subclass, see the relevant subclass, e.g. B01L; measuring or testing processes other than immunoassay, involving enzymes or microorganisms C12M, C12Q; investigation of foundation soil in situ E02D1/00; sensing humidity changes for compensating measurements of other variables or for compensating readings of instruments for variations in humidity, see G01D or the relevant subclass for the variable measured; testing or determining the properties of structures G01M; measuring or investigating electric or magnetic properties of materials G01R; systems or methods in general, using reception or emission of radiowaves or other waves and based on propagation effects, e.g. Doppler effect, propagation time, direction of propagation, G01S; determining sensitivity, graininess, or density of photographic materials G03C5/02; testing component parts of nuclear reactors G21C17/00; {controlling or regulating non-electric variables G05D; measuring degree of ionisation of ionised gases, i.e. plasma H05H1/0006; testing electrographic developer properties G03G15/0848}) Investigating or analysing materials by the use of optical means, i.e. using infra-red, visible or ultra-violet light (G01N3/00-G01N19/00 take precedence) . Systems specially adapted for particular applications .. Investigating the presence of flaws or contamination ... characterised by the material or shape of the object to be examined (G01N21/89 - G01N21/91, G01N21/94 take precedence) {Objects of complex shape, e.g. examined with use of a surface follower device (measuring contours and curvatures G01B11/24)} {using a surface follower, e.g. robot} Automatic analysis not limited to methods or materials provided for in any single one of groups G01N1/00 - G01N33/00; Handling materials therefor . {comprising robots or similar manipulators (robots per se B25J)}
G01S	RADIO DIRECTION-FINDING; RADIO NAVIGATION; DETERMINING DISTANCE OR VELOCITY BY USE OF RADIO WAVES; LOCATING OR PRESENCE-DETECTING BY USE OF THE REFLECTION OR RERADIATION OF RADIO WAVES; ANALOGOUS ARRANGEMENTS USING OTHER WAVES ((for special applications, see the relevant subclasses, e.g. A61B, G01F, G01N, G02B; measuring dimensions or angles of objects G01B; navigation in general G01C; measuring infrasonic, sonic or ultrasonic vibrations in general G01H; measuring infra-red, visible, or ultra-violet radiation in general G01J; transducers per se, see

CPC/IPC/FI Symbols	Description
G01S13/00	the relevant subclasses, e.g. G01L, H01L, H04R; measuring direction or velocity of flowing fluids by reception or emission of radiowaves or other waves and based on propagation effects caused in the fluid itself G01P; measuring electric or magnetic variables in general G01R}; detecting masses or objects by methods not involving reflection or radiation of radio, acoustic or other waves G01V; {time-interval measuring G04F}; aerials H01Q)
G01S13/88	Systems using the reflection or reradiation of radio waves, e.g. radar systems; Analogous systems using reflection or reradiation of waves whose nature or wavelength is irrelevant or unspecified (using acoustic waves G01S15/00; using electromagnetic waves other than radio waves G01S17/00)
<u>G01S13/881</u>	. Radar or analogous systems specially adapted for specific applications (electromagnetic prospecting or detecting of objects, e.g. near-field detection, G01V3/00)
<u>G01S13/881</u>	.. {for robotics}
G05	CONTROLLING; REGULATING (specially adapted to a particular field of use, see the relevant place for that field, e.g. A62C37/00, B03B13/00, B23Q)
G05B	CONTROL OR REGULATING SYSTEMS IN GENERAL; FUNCTIONAL ELEMENTS OF SUCH SYSTEMS; MONITORING OR TESTING ARRANGEMENTS FOR SUCH SYSTEMS OR ELEMENTS (fluid-pressure actuators or systems acting by means of fluids in general F15B; valves per se F16K; characterised by mechanical features only G05G; sensitive elements, see the appropriate subclass, e.g. G12B, subclass of G01, H01; correcting units, see the appropriate subclass, e.g. H02K)
G05B2219/00	Program-control systems
G05B2219/30	. Nc systems
G05B2219/43	.. Speed, acceleration, deceleration control ADC
<u>G05B2219/43119</u>	... Adapt robot motion to machine speed as function of error from programmed speed
G05B2219/45	.. Nc applications
<u>G05B2219/45058</u>	... Grinding, polishing robot
<u>G05B2219/45059</u>	... Drilling robot
<u>G05B2219/45061</u>	... Measuring robot
<u>G05B2219/45062</u>	... Surface finishing robot
<u>G05B2219/45064</u>	... Assembly robot
<u>G05B2219/45065</u>	... Sealing, painting robot
<u>G05B2219/45066</u>	... Inspection robot
<u>G05B2219/45068</u>	... Cutting robot
<u>G05B2219/45073</u>	... Microrobot
<u>G05B2219/45074</u>	... Edge treating robot, machine
<u>G05B2219/45079</u>	... Stripping robot, strip pieces of garments from table
<u>G05B2219/45081</u>	... Tuning robot for amplifiers
<u>G05B2219/45082</u>	... Sanding robot, to clean surfaces
<u>G05B2219/45083</u>	... Manipulators, robot
<u>G05B2219/45084</u>	... Service robot
<u>G05B2219/45085</u>	... Space robot
<u>G05B2219/45086</u>	... Brick laying, masonry robot
<u>G05B2219/45087</u>	... Gymnast robot, acrobat
<u>G05B2219/45088</u>	... Riveting robot
<u>G05B2219/45089</u>	... Testing robot
<u>G05B2219/45091</u>	... Screwing robot, tighten or loose bolt
<u>G05B2219/45092</u>	... Analysing or chemical synthesis robot, moving samples from station to station
G05D	SYSTEMS FOR CONTROLLING OR REGULATING NON-ELECTRIC VARIABLES (for continuous casting of metals B22D11/16; valves per se F16K; sensing non-electric variables, see the relevant subclasses of G01; for regulating electric or magnetic variables G05F)
<u>G05D1/00</u>	Control of position, course or altitude of land, water, air, or space vehicles, e.g. automatic pilot (steering applicable only to other than landborne vehicles, e.g. three-dimensional steering applicable to both aircraft and submarines)

CPC/IPC/FI Symbols	Description
G05D2201/00 G05D2201/02 <u>G05D2201/0217</u>	B60K;construction or disposition of steering means on land vehicles B62, on waterborne vessels B63;manual or automatic control of aircraft, e.g. using automatic pilot or radiated signal B64C;radio navigation systems or analogous systems using other waves G01S) Application . Control of position of land vehicles .. Anthropomorphic or bipedal robot
G06 G06F G06F15/00 <u>G06F15/18</u> <u>G06F19/00</u>	COMPUTING; CALCULATING; COUNTING (score computers for games A63B71/06, A63D15/20, A63F1/18; combinations of writing implements with computing devices B43K29/08) ELECTRIC DIGITAL DATA PROCESSING (computer systems based on specific computational models G06N) Digital computers in general (details G06F1/00 - G06F13/00); Data processing equipment in general . in which a program is changed according to experience gained by the computer itself during a complete run; Learning machines (adaptive control systems G05B13/00; artificial intelligence G06N) Digital computing or data processing equipment or methods, specially adapted for specific applications (specially adapted for specific functions G06F17/00; data processing systems or methods specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes G06Q; healthcare informatics G16H)
G06N <u>G06N3/00</u>	COMPUTER SYSTEMS BASED ON SPECIFIC COMPUTATIONAL MODELS Computer systems based on biological models (analogue computers simulating functional aspects of living beings G06G7/60)
H H01 H01H H01H2231/00 <u>H01H2231/04</u>	ELECTRICITY BASIC ELECTRIC ELEMENTS ELECTRIC SWITCHES; RELAYS; SELECTORS; EMERGENCY PROTECTIVE DEVICES (contact cables H01B7/10; overvoltage protection resistors, resistive arresters H01C7/12, H01C8/04; electrolytic self-interrupters H01G9/18; switching devices of the waveguide type H01P; devices for interrupted current collection H01R39/00; overvoltage arresters using spark gaps H01T4/00; emergency protective circuit arrangements H02H; switching by electronic means without contact-making H03K17/00) Applications . Robot
H01L <u>H01L21/00</u> <u>H01L21/67</u>	SEMICONDUCTOR DEVICES; ELECTRIC SOLID STATE DEVICES NOT OTHERWISE PROVIDED FOR (use of semiconductor devices for measuring G01; resistors in general H01C; magnets, inductors {in general} , transformers H01F; capacitors in general H01G; electrolytic devices H01G9/00; batteries, accumulators H01M; waveguides, resonators or lines of the waveguide type H01P; line connectors, current collectors H01R; stimulated emission devices H01S; electromechanical resonators H03H; loudspeakers, microphones, gramophone pick-ups or like acoustic electromechanical transducers H04R; electric light sources in general H05B; printed circuits, hybrid circuits, casings or constructional details of electric apparatus, manufacture of assemblages of electrical components H05K; use of semiconductor devices in circuits having a particular application, see the subclass for the application) Processes or apparatus adapted for the manufacture or treatment of semiconductor or solid state devices or of parts thereof ((testing or measuring during manufacture or treatment, or reliability measurements H01L22/00; multistep manufacturing processes for passive two-terminal components without a potential-jump or surface barrier for integrated circuits H01L28/00;); processes or apparatus peculiar to the manufacture or treatment of devices provided for in groups H01L31/00 - H01L51/00 or of parts thereof, see these groups; single-step processes covered by other subclasses, see the relevant subclasses, e.g. C23C, C30B; photomechanical production of textured or patterned surfaces, materials or originals therefor, apparatus specially adapted therefor, in general G03F) . Apparatus specially adapted for handling semiconductor or electric solid state devices during manufacture or treatment thereof; Apparatus specially adapted for handling wafers during manufacture or treatment of semiconductor or electric solid

CPC/IPC/FI Symbols	Description
	state devices or components (; Apparatus not specifically provided for elsewhere (processes per se H01L21/30, H01L21/46, H01L23/00; simple temporary support means, e.g. using adhesives, electric or magnetic means H01L21/68, H01L21/302; apparatus for manufacturing arrangements for connecting or disconnecting semiconductor or solid-state bodies and for methods related thereto H01L24/74;)) .. for positioning, orientation or alignment (for conveying H01L21/677)
<u>H01L21/68</u>	
H04	ELECTRIC COMMUNICATION TECHNIQUE
H04Q	SELECTING (switches, relays, selectors H01H; electronic switches H03K17/00)
H04Q1/00	Details of selecting apparatus or arrangements {for establishing connections among stations for the purpose of transferring information via these connections}
H04Q1/02	. Constructional details
H04Q1/14	.. Distribution frames
<u>H04Q1/147</u>	... {using robots for distributing}
Y	GENERAL TAGGING OF NEW TECHNOLOGICAL DEVELOPMENTS; GENERAL TAGGING OF CROSS-SECTIONAL TECHNOLOGIES SPANNING OVER SEVERAL SECTIONS OF THE IPC; TECHNICAL SUBJECTS COVERED BY FORMER USPC CROSS-REFERENCE ART COLLECTIONS [XRACs] AND DIGESTS
Y10	TECHNICAL SUBJECTS COVERED BY FORMER USPC
<u>Y10S</u>	TECHNICAL SUBJECTS COVERED BY FORMER USPC CROSS-REFERENCE ART COLLECTIONS [XRACs] AND DIGESTS
Y10S320/00	Electricity: battery or capacitor charging or discharging
<u>Y10S320/34</u>	. Robot, hybrid, recreational or emergency vehicle
Y10S700/00	Data processing: generic control systems or specific applications
<u>Y10S700/90</u>	. Special robot structural element

The complete description of the CPC classes with IPC- and FI-concordances can be found in the Internet at <http://web2.wipo.int/classifications/ipc/ipcpub?notion=scheme&fipccp=yes&indexes=yes>.

2.1.1 International Patent Classification (IPC)

IPC Symbols	Description
A	HUMAN NECESSITIES
A61	MEDICAL OR VETERINARY SCIENCE; HYGIENE
A61B	DIAGNOSIS; SURGERY; IDENTIFICATION (analysing biological material G01N, e.g. G01N33/48)
A61B34/00	Computer-aided surgery; Manipulators or robots specially adapted for use in surgery [2016.01]
<u>A61B34/30</u>	.Surgical robots [2016.01]
A63	SPORTS; GAMES; AMUSEMENTS
A63F	CARD, BOARD OR ROULETTE GAMES; INDOOR GAMES USING SMALL MOVING PLAYING BODIES; VIDEO GAMES; GAMES NOT OTHERWISE PROVIDED FOR [5]
A63F13/00	Video games, i.e. games using an electronically generated display having two or more dimensions [7,2006.01,2014.01]
A63F13/80	.Special adaptations for executing a specific game genre or game mode [2014.01]
<u>A63F13/803</u>	..Driving vehicles or craft, e.g. cars, airplanes, ships, robots or tanks [2014.01]
A63H	TOYS, e.g. TOPS, DOLLS, HOOPS, BUILDING BLOCKS
<u>A63H11/00</u>	Self-movable toy figures [1,2006.01]
B	PERFORMING OPERATIONS; TRANSPORTING
B25	HAND TOOLS; PORTABLE POWER-DRIVEN TOOLS; HANDLES FOR HAND IMPLEMENTS; WORKSHOP EQUIPMENT; MANIPULATORS
B25J	MANIPULATORS; CHAMBERS PROVIDED WITH MANIPULATION DEVICES (robotic devices for individually picking fruits, vegetables, hops or the like A01D46/30; needle manipulators for surgery A61B17/062; manipulators associated with rolling mills B21B39/20; manipulators associated with forging machines B21J13/10; means for holding wheels or parts thereof B60B30/00; cranes B66C; arrangements for handling fuel or other materials which are used within nuclear reactors G21C19/00;

IPC Symbols	Description
B25J5/00	structural combination of manipulators with cells or rooms shielded against radiation G21F7/06) [5]
B25J9/00	Manipulators mounted on wheels or on carriages (B25J1/00 takes precedence; programme-controlled manipulators B25J9/00) [1,2006.01]
B25J15/00	Programme-controlled manipulators [1,2006.01]
B25J17/00	Gripping heads [1,2006.01]
B25J18/00	Joints [1,2006.01]
B25J18/00	Arms [4,2006.01]
B62	LAND VEHICLES FOR TRAVELLING OTHERWISE THAN ON RAILS
B62D	MOTOR VEHICLES; TRAILERS (steering, or guiding on a desired track, of agricultural machines or implements A01B69/00; wheels, castors, axles, increasing wheel adhesion B60B; vehicle tyres, tyre inflation or tyre changing B60C; connections between vehicles of a train or the like B60D; vehicles for use on rail and road, amphibious or convertible vehicles B60F; suspension arrangements B60G; heating, cooling, ventilating or other air treating devices B60H; windows, windscreens, non-fixed roofs, doors or similar devices, protective coverings for vehicles not in use B60J; propulsion plant arrangements, auxiliary drives, transmissions, controls, instrumentation or dashboards B60K; electric equipment or propulsion of electrically-propelled vehicles B60L; power supply for electrically-propelled vehicles B60M; passenger accommodation not otherwise provided for B60N; adaptations for load transportation or to carry special loads or objects B60P; arrangement of signalling or lighting devices, the mounting or supporting thereof or circuits therefor, for vehicles in general B60Q; vehicles, vehicle fittings or vehicle parts, not otherwise provided for B60R; servicing, cleaning, repairing, supporting, lifting, or manoeuvring, not otherwise provided for B60S; brake arrangements, brake control systems or parts thereof B60T; air-cushion vehicles B60V; motorcycles, accessories therefor B62J, B62K; testing of vehicles G01M)
B62D57/00	Vehicles characterised by having other propulsion or other ground-engaging means than wheels or endless track, alone or in addition to wheels or endless track (sledges B62B; motor sledges B62M) [1,5,2006.01]
B62D57/02	.with ground-engaging propulsion means, e.g. walking members [1,2006.01]

The complete description of the IPC classes can be found in the Internet at <http://web2.wipo.int/classifications/ipc/ipcpub>

3 Keywords

The following keyword concepts were used:

- Robot/manipulator
- artificial intelligence
- Self-steering/self-guided/unmanned
- Automated/autonom
- Device/machine/apparatus/object

4 Confidence Interval for Precision

Precision is expressed in percent of relevant counts. The 95 % confidence interval for the precision of a technology field is assessed on a mix of 100 randomly selected patent families based on a binomial distribution.

Precision Confidence Interval: 85 – 96 %

5 History

Version	latest update	Comment
_05_19	23.05.2019	no change
_09_19	28.08.2019	no change
_12_19	14.01.2020	change to new PS syntax
_03_20	09.03.2020	no change
_09_20	10.09.2020	refinement of keywords
_03_21	24.03.2021	no change
_09_21	25.08.2021	no change

6 Contact

For specific information regarding the technology field please contact info@ip-search.swiss

Eidgenössisches Institut für Geistiges Eigentum	ip-search
Institut Fédéral de la Propriété Intellectuelle	Stauffacherstrasse 65/59g CH-3003 Bern
Istituto Federale della Proprietà Intellettuale	T +41 31 377 77 77 F +41 31 377 77 78
Swiss Federal Institute of Intellectual Property	info@ip-search.swiss www.ip-search.swiss